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condensate to form as a result of the enrichment process. The liquid knockout vessel must have—

(1) A means to indicate the level of liquid in the device;

(2) A high liquid level sensor that activates an alarm that satisfies the requirements of 33 CFR 154.2100(e); and

(3) A high-high liquid level sensor that closes the remotely operated cargo vapor shutoff valve required by 33 CFR 154.2101(a) and shuts down any vapor-moving device before liquid is carried over to the vapor-moving device. One sensor with two stages may be used to meet this requirement as well as paragraph (e)(2) of this section.

§ 154.2202 Vapor line connections.

(a) 33 CFR 154.2101(a), (e), and (g) apply to a tank barge cleaning facility's (TBCF's) vapor control system (VCS).

(b) The remotely operated cargo vapor shutoff valve required by 33 CFR 154.2101(a) must be located upstream of the liquid knockout vessel required by 33 CFR 154.2201(e).

(c) A fluid displacement system must have a remotely operated shutoff valve installed in the fluid injection supply line between the point where the inert gas or other medium is generated and the fluid injection connection. The valve must comply with 33 CFR 154.2101(a)(1) through (6).

(d) Each hose used for transferring vapors must—

(1) Have a design burst pressure of at least 25 pounds per square inch gauge (psig);

(2) Have a maximum allowable working pressure (MAWP) no less than 5 psig;

(3) Be capable of withstanding at least the maximum vacuum rating of the vapor-moving device without collapsing or constricting;

(4) Be electrically continuous, with a maximum resistance of 10,000 ohms;

(5) Have flanges with a bolthole arrangement complying with the requirements for Class 150 ANSI B16.5 flanges (incorporated by reference, see 33 CFR 154.106);

(6) Be abrasion and kinking resistant; and

(7) Be compatible with vapors being transferred.

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(e) Fixed vapor collection arms must meet the requirements of paragraph (d) of this section.

§ 154.2203 Facility requirements for barge vapor overpressure and vacuum protection.

In this section, the requirements of having a flame arrester or a flame screen at the opening of a pressure relief valve or a vacuum relief valve apply only to facilities collecting vapors of flammable, combustible, or non-high flash point liquid cargoes.

(a) A facility vapor collection system must have a capacity for collecting cleaning facility vapors at a rate of no less than 1.1 times the facility's maximum allowable gas-freeing rate, plus any inerting, diluting, or enriching gas that may be added to the system.

(b) A facility vapor control system (VCS) must be designed to prevent the pressure in a vessel's cargo tanks from going below 80 percent of the highest setting of any of the barge's vacuum relief valves or exceeding 80 percent of the lowest setting of any of the barge's pressure relief valves. The VCS must be capable of maintaining the pressure in the barge's cargo tanks within this range at any gas-freeing rate less than or equal to the maximum gas-freeing rate determined by the requirements in 46 CFR 39.6007(c).

(c) A fluid displacement system must provide a pressure-sensing device that activates an alarm that satisfies the requirements of 33 CFR 154.2100(e) when the pressure at the fluid injection connection exceeds either the pressure corresponding to the upper pressure determined in paragraph (b) of this section or a lower pressure agreed upon by the facility and barge persons in charge. The pressure-sensing device must be located in the fluid displacement system's piping downstream of any devices that could potentially isolate the barge's vapor collection system from the pressure-sensing device. The pressure measured by the sensing device must be corrected for pressure drops across any barge piping, hoses, or arms that are used to inject the fluid.

(d) A fluid displacement system must provide a pressure-sensing device that is independent of the device required by paragraph (c) of this section. This

pressure-sensing device must activate the fluid displacement system emergency shutdown and close the remotely operated cargo vapor shutoff valve required by 33 CFR 154.2101(a). It must also close the remotely operated shutoff valve required by 33 CFR 154.2202(c) when the pressure at the fluid injection connection reaches a corresponding 90 percent of the lowest setting of any pressure relief valve on the barge. The pressure-sensing device must be located in the fluid displacement system's piping downstream of any device that could potentially isolate the barge's VCS from the pressure-sensing device. The pressure measured by the sensing device must be corrected for pressure drops across any barge piping, hoses, or arms that are used to inject the fluid.

(e) If a vapor-moving device capable of drawing more than 0.5 pounds per square inch gauge (psig) vacuum is used to draw vapor, air, inert gas, or other medium from the barge, a vacuum relief valve must be installed on the facility's fixed vapor collection system piping between the facility vapor connection and the vapor-moving device. The vacuum relief valve must—

(1) Relieve at a pressure such that the pressure at the facility vapor connection is maintained at or above 14.2 pounds per square inch absolute (psia) (–0.5 psig);

(2) Have a relieving capacity equal to or greater than the maximum capacity of the vapor-moving device;

(3) Have a flame arrester or flame screen fitted at the vacuum relief opening;

(4) Have been tested for relieving capacity in accordance with paragraph 1.5.1.3 of API 2000 (incorporated by reference, see 33 CFR 154.106), with a flame arrester or flame screen fitted; and

(5) Be constructed of materials compatible with the vapors being gas-freed.

(f) The vacuum relief valve requirements of paragraph (e) of this section may include a valve to isolate it from the facility vapor collection piping, provided—

(1) The isolation valve must be interlocked with any vapor-moving device such that the vapor-moving device cannot activate unless the isolation

valve is in the full open position (*i.e.*, the vacuum relief valve is not isolated); and

(2) The isolation valve can only be closed after the facility person in charge has acknowledged that the hatch opening required by 33 CFR 154.2250(i) is open and secured.

(g) If a vapor-moving device capable of drawing more than 0.5 psig vacuum is used to draw vapor, air, inert gas, or other medium from the barge, the facility must install portable, intrinsically safe, pressure-sensing devices on any cargo tank, or on the common vapor header, at the connection required by 46 CFR 39.6003(b) before any cleaning operation begins on the tank. A pressure-sensing device must be provided that—

(1) Activates an alarm that satisfies 33 CFR 154.2100(e) when the pressure in the cargo tank being cleaned falls below 80 percent of the highest setting of any of the barge's vacuum relief valves, or a higher pressure agreed upon by the facility and barge persons in charge; and

(2) Activates the emergency shutdown system for the vapor-moving device and closes the remotely operated cargo vapor shutoff valve described in 33 CFR 154.2101(a) when the pressure in the cargo tank being cleaned falls below 90 percent of the highest setting of any of the barge's vacuum relief valves, or a higher pressure agreed upon by the facility and barge persons in charge. This pressure-sensing device must be independent of the device used to activate an alarm required by paragraph (g)(1) of this section.

(h) The pressure-sensing devices required by paragraph (g) of this section must—

(1) Have suitable means, such as approved intrinsic safety barriers that are able to accept passive devices, so that the under-pressure alarm circuits of the barge side of the under-pressure control system, including cabling, normally closed switches, and pin and sleeve connectors, are intrinsically safe;

(2) Be connected to the under-pressure alarm system by a four-wire, 16-ampere shielded flexible cable; and

(3) Have cable shielding grounded to the under-pressure alarm system.

(i) A pressure-indicating device must be provided within 6 meters (19.7 feet) of the facility vapor connection which displays the pressure in the vapor collection line upstream of any isolation valve and any devices, such as strainers, that could cause a blockage in the vapor line.

(j) A fluid displacement system must include a pressure-indicating device that displays the pressure in the fluid displacement system injection line. This device must be within 6 meters (19.7 feet) of the fluid injection connection.

(k) If a fluid displacement system used to inject inert gas or another medium into the cargo tank of a barge being gas-freed is capable of producing a pressure greater than 2 psig, a pressure relief valve must be installed in the fluid displacement system injection line between the fluid injection source and the fluid injection connection that—

(1) Relieves at a predetermined pressure such that the pressure in the fluid displacement system at the fluid injection connection does not exceed 1.5 psig;

(2) Has a relieving capacity equal to or greater than the maximum volumetric flow capacity of the fluid displacement system;

(3) Has a flame screen or flame arrester fitted at the relief opening; and

(4) Has been tested for relieving capacity in accordance with paragraph 1.5.1.3 of API 2000, when fitted with a flame screen or flame arrester.

(l) When using the fluid displacement system, if the pressure in the facility's fixed vapor collection system can exceed 2 psig during a malfunction in an inerting, enriching, or diluting system, a pressure relief valve must—

(1) Be installed between the point where inerting, enriching, or diluting gas is added to the facility's fixed vapor collection system piping and the facility vapor connection;

(2) Relieve at a predetermined pressure such that the pressure at the facility vapor connection does not exceed 1.5 psig;

(3) Have a relieving capacity equal to or greater than the maximum capacity of the facility's inerting, enriching, or diluting gas source;

(4) Have a flame screen or flame arrester fitted at the relief opening;

(5) Have been tested for relieving capacity in accordance with paragraph 1.5.1.3 of API 2000, when fitted with a flame screen or flame arrester; and

(6) Be constructed of materials compatible with the vapors being gas-freed.

(m) For fluid displacement systems, the fluid injection connection must be electrically insulated from the fluid injection source in accordance with OCIMF ISGOTT section 17.5 (incorporated by reference, see 33 CFR 154.106).

(n) If the pressure relief valve is not designed with a minimum vapor discharge velocity of 30 meters (98.4 feet) per second, the relieving capacity test required by paragraphs (k)(4) and (l)(5) of this section must be carried out with a flame screen or flame arrester fitted at the discharge opening.

(o) A pressure indicating device must be provided by the facility for installation at the connection required by 46 CFR 39.6003(b).

§ 154.2204 Fire, explosion, and detonation protection.

This section applies to tank barge cleaning facilities (TBCFs) collecting vapors of flammable, combustible, or non-high flash point liquid cargoes.

(a) A vapor control system (VCS) with a single facility vapor connection that processes vapor with a vapor recovery unit must—

(1) Have a detonation arrester located as close as practicable to the facility vapor connection. The total pipe length between the detonation arrester and the facility vapor connection must not exceed 18 meters (59.1 feet) and the vapor piping between the detonation arrester and the facility vapor connection must be protected from any potential internal or external ignition source; or

(2) Have an inerting, enriching, or diluting system that meets the requirements of 33 CFR 154.2107.

(b) A VCS with a single facility vapor connection that processes vapor with a vapor destruction unit must—

(1) Have a detonation arrester located as close as practicable to the facility vapor connection. The total pipe length between the detonation arrester